

Technical Article

Three Hidden Traps of Low Flow Cutoff

By McCrometer

Steam system operators can pay a high price for generating product that passes through a meter but fails to get measured.

Also known as low flow cutoff, those losses are a function of the turndown ratio within flow meters. The ratio — defined as the maximum measurement capability of a device compared to its minimum — dictates how wide a flow spectrum can be measured. Picture it this way: The total volume of steam produced by a system is like a parking lot. Only having enough asphalt available to apply a sealcoat to cover two-thirds of the lot is akin to the turndown ratio.

Using a flow meter with maximum setting that's too high is comparable to sealcoating portions of the parking lot that never get used while neglecting parts that regularly attract drivers.

In a steam system with low flow cutoff issues, operators face three big pitfalls:

Missed Revenue

When writing specifications for a steam meter, engineers tend to be more interested in the potential maximum flow, even if a system will never come close to producing those numbers, while going out of their way to avoid a flow that's too low, even if it's a better option.

For example, a meter with a maximum capacity of 10,000 lbs/hour and a turndown ratio of 10:1 has a low flow cutoff of 1,000. Realistically, that system is producing closer to 3,000 lbs/hour and will never even come close to reaching the high end. At certain times, however, the system is operating closer to 300 lbs/hour, all of which fails to register.

This lack of metering at the lower end of production is a missed opportunity. Revenue is simply disappearing into thin air.

System Overdesign

Focusing on unrealistic flow maximums can also result in the overdesign of entire systems (i.e., pipes that are too large and inappropriate meters). When considering a new system, be realistic about whether it will ever hit max production and look closely at velocities as a method of checks and balances.

It's unusual to be able to push steam, or any gas, on a sustained basis more than 200'/second. If the maximum flow of a system under consideration equates to more than that, request a more thorough review and explanation because it is likely being designed to the wrong specifications.

In some cases, the overdesign problem has been so bad that operators have been forced to replace meters in newer systems to address low flow cutoff problems.

Erratic Flows

Another issue with low flow cutoff is erratic flows. A steam system operating close to the lower end of the scale will show a drop to zero every time the flow dips below the low flow cutoff. If the cutoff is set to 100 lbs/hour, the meter will appear to be erratic as the readings go from zero to 100 lbs/hour and back.

Erratic flow readings can unnecessarily attract attention from operators.

Metering Solutions

Vortex meters, which contain a shredder bar mounted across the diameter of a pipe to measure flow, are common for measuring steam and work well for higher flows. When it comes to low flows, however, they can just stop working completely. On the other hand, differential pressure (DP) flow meters in similar situations — with the proper electronics incorporated — can push the low flow cutoff value downward.

That ability to adjust can make a big difference in the bottom line of a steam plant.

For example, McCrometer's ExactSteam™ V-Cone® is a DP-type meter configured for energy metering or mass flow with a flow accuracy of ± 0.5 percent with up to a 50:1 turndown ratio. The ExactSteam™ V-Cone® System acts as its own flow conditioner, fully conditioning and mixing the flow prior to measurement. This virtually eliminates the need for upstream or downstream straight pipe runs, so it can be installed nearly anywhere in a piping system or easily as a retrofit into an existing piping layout.

Unmeasured steam is wasted steam and missing targets at the lower end of the flow range could be costing your plant thousands of dollars annually, or more. A better approach to flow meters and system design — focused more on the lower end of the spectrum and less on the potential maximums, while incorporating the appropriate metering technology — can make a massive, positive difference.

